

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bianchin et al. (PN 5223193) in view of Rusche (Pub No 2001/0041233).

a. Bianchin teaches a method for rotational molding a polyurethane article in which a two pack system (col 5 Example 1 teaches use of a system comprising component A and B. The distinguishing of the two components presumes a two-pack system despite the recitation of a pre-mixed polyurethane system. This system is introduced into a rotational molding machine, cured, and removed from the mold, wherein the article formed is a sphere of 22.5 centimeters in diameter with a thickness of 2.4 to 3.3 millimeters formed in 90 seconds and allowed to stand for 5 minutes (col 5 example 1, by forming in 90 seconds the resin has a

working life of 90 seconds). The sphere taught by Bianchin has a diameter of 22.5 centimeters which results in a total volume of 5,961 cubic centimeters. The thickness of the sphere is 2.4 to 3.3 millimeters which equals a resin volume of 381.5 to 556.4 cubic centimeters. This means that the percentage of the mold filled with resin is between 6.4 and 9.3%. Bianchin does not teach that the process of molding is repeated to increase the thickness of the part.

b. Rusche teaches a method for rotational molding a polyurethane article in which a polyurethane resin molding process can be repeated as many times as desired to increase the thickness of the article (§ 0034). It would have been obvious to one of ordinary skill in the art at the time the invention was made to repeat the resin application step of the process of Bianchin after five minutes of allowing the article to sit in the mold to increase the thickness of the article formed. With regards to the limitation of repeating three to six times, it would have been obvious to one of ordinary skill in the art at the time the invention was made to repeat the molding process three to six times to achieve a desired thickness of the outer skin. The article produced in this method would be capable of use as a precious casting in a lost wax method.

c. Note that, polyurethane composition of Bianchin et al is taken to be a two-pack system. Even if it is not, Rusche teaches that the components of the polyol and isocyanate are mixed just prior to application, as in a two-pack system. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a two-pack polyurethane system in place of the pre-

made polyuretan system of Bianchin in order to enhance the pot-life of the resin without the need for masking the reactive functional group (e.g. NCO).

d. With regards to claim 18 with respect to claim 9, the article formed by Bianchin in view of Rusche after repeating the molding process three to six times results in a thickness of 1.05 to 2.1 millimeters using 3.3 millimeters as the thickness. This results in a inner hollow volume of 70 to 44 %.

4. Claims 10-13, and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bianchin et al. (PN 5223193) in view of Rusche (Pub No 2001/0041233) as applied to claim 9 above, and further in view of Vihtelic et al. (PN 6481490).

e. With regards to claim 10 with respect to claim 9, Bianchin in view of Rusche as applied above teaches a method for forming a polyurethane product through rotational molding using three to six coats of resin resulting in a 70 to 44% hollow article and that the composition may contain a plasticizer, dibutyl adipate (col 2 ln 42, of Bianchin); however, it does not teach that the polyol has a functionality of at least 2.8, the isocyanate has a functionality of 2, and the NCO/OH ratio is .7 to 1.0.

f. Vihtelic teaches a polyurethane composition for use in casting of polyurethane parts in which the composition yields a part free of detrimental or excessive organometallic catalysts (col 3 ln 6-9) in which the polyol has a functionality greater than 2.8, the isocyanate has a functionality greater than 2 (col 3 ln 50-63), and the NCO/OH ratio is **about** 1.02 to **about** 1.05 (col 3 ln 35-

36, the numerical range of **about** 1.02 to **about** 1.05 includes the value of a ratio of 1.0. In cases where numerical ranges are defined with the word **about**, *Ortho-McNeil Pharm., Inc. v Caraco Pharm. Labs, Ltd.* held that a numerical ratio of **about** 1:5 spanned from 1:3.6 to 1:7.1, a difference of over +/- 25%). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the composition of Vihtelic with plasticizer in the molding of the article taught by Bianchin in view of Rusche to be substantially free of detrimental or excessive organometallic catalysts.

g. With regards to claim 11 with respect to claim 10, the claim requires that "the plasticizer is micro-dispersed through phase separation at said reaction hardening". While Bianchin does not explicitly teach that the plasticizer dibutyl adipate is micro-dispersed through phase separation, it would be micro-dispersed due to the short work life of the polyurethane resin (90 seconds) and the hydrophilic and hydrophobic forces at work in the polymer resin solution and plasticizer, as clarified by the applicant in the specification.

NOTE: Where ... the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. **Whether the rejection is based on "inherency" under 35 USC § 102, on prima facie obviousness" under 35 USC § 103, jointly or alternatively, the burden of proof is the same, and its fairness is evidenced by the PTO's inability to manufacture products or to obtain and compare prior art products."** In re Best, 562 F2d 1252, 1255, 195 USPQ 430, 433-4 (CCPA 1977).

h. With regards to claims 12 and 13, Rusche teaches including a filler of about 15% to about 50% by weight or about 15% to about 35% (abstract) by

weight in order to reduce pooling and puddling in the process (§ 0011). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a filler of 35% by weight to reduce puddling and pooling in the rotational molding process. This filler amounting to 35% by weight when combined with the polyurethane formulation of Vihtelic applied above provides a composition wherein the polyether polyol portion of the polyurethane represents 17% by weight (weight percentages calculated from table in col 3 of Vihtelic). Polyether polyols of molecular weight less than 2150 contain the claimed structure required to be in 2-25% by weight of the composition.

- i. With regards to claims 19-21, the article formed by Bianchin in view of Rusche after repeating the molding process three to six times results in a thickness of 1.05 to 2.1 millimeters using 3.3 millimeters as the thickness. This results in a inner hollow volume of 70 to 44 %.
5. Claims 14 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bianchin et al. (PN 5223193) in view of Rusche (Pub No 2001/0041233) as applied to claim 9 above, and further in view of Sagawa (JP 2000-137447, English abstract provided)
 - j. With regards to claim 14, Bianchin in view of Rusche teaches a method for rotational molding of a polyurethane part in which a polyurethane composition containing 35% by weight filler is used (abstract of Rusche) in order to reduce pooling and puddling in the process (§ 0011 of Rusche); however, it does not teach that the filler is wax.

- k. Sagawa teaches that paraffin wax is added to two-pack polyurethane resin to reduce the tackiness of the formed product (abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include wax as the filler at 35 % by weight for the part made by Bianchin in view of Rusche to reduce the tackiness of the finished article.
- l. With regards to claims 22, the article formed by Bianchin in view of Rusche after repeating the molding process three to six times results in a thickness of 1.05 to 2.1 millimeters using 3.3 millimeters as the thickness. This results in a inner hollow volume of 70 to 44 %.
6. Claims 15-17 and 23-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bianchin et al. (PN 5223193) in view of Rusche (Pub No 2001/0041233) in view of Vihtelic et al. (PN 6481490) as applied to claims 12 and 13 above, and further in view of Sagawa (JP 2000-137447, English abstract provided).
- m. With regards to claims 15-17, Bianchin in view of Rusche in view of Vihtelic teaches a method for rotational molding of a polyurethane part in which a polyurethane composition containing 35% by weight filler is used; however, it does not teach that the filler is wax.
- n. Sagawa teaches that paraffin wax is added to two-pack polyurethane resin to reduce the tackiness of the formed product (abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include wax as the filler at 35 % by weight for the part made by Bianchin in view of Rusche in view of Vihtelic to reduce the tackiness of the finished article.

o. With regards to claims 23-25, the article formed by Bianchin in view of Rusche after repeating the molding process three to six times results in a thickness of 1.05 to 2.1 millimeters using 3.3 millimeters as the thickness. This results in a inner hollow volume of 70 to 44 %.

p. With regards to claim 27, the article formed by Bianchin in view of Rusche in view of Vihtelic in view of Sagawa is a composite polyurethane in which there is a hard polyurethane shell. Bianchin teaches that the shell is then filled with polyurethane foam (col 6 example 3).

q. With regards to claim 26, the article formed by Bianchin in view of Rusche in view of Vihtelic in view of Sagawa is a composite polyurethane in which there is a hard polyurethane shell. Bianchin teaches that the shell is then filled with polyurethane foam (col 6 example 3), but not wax. Vihtelic teaches that solid polyurethane composites of a hard polyurethane coating and a polyurethane core are used in investment casting in which the article forms a core for a metal cast part and is then burned out to leave the cast metal structure (Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the article formed in investment casting. As such, Vihtelic teaches that wax can be used in the investment casting article as well (col 1 ln 12-15) giving reason for the term "lost-wax" processing. It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute wax for polyurethane foam in the core of the article as such material is an art recognized equivalent.

- r. With regards to claims 28 and 29, the article formed by Bianchin in view of Rusche in view of Vihtelic in view of Sagawa is used in a lost-wax process as noted by Vihtelic (abstract).
7. Claims 10-17, 19-25, 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bianchin et al. (PN 5223193) in view of Rusche (Pub No 2001/0041233) as applied to claim 9 above, and further in view of Matsuoka et al. (JP 2003-290871-A, machine translation provided).
- s. With regards to claim 10 with respect to claim 9, Bianchin in view of Rusche as applied above teaches a method for forming a polyurethane product through rotational molding using three to six coats of resin resulting in a 70 to 44% hollow article and that the composition may contain a plasticizer, dibutyl adipate (col 2 ln 42, of Bianchin); however, it does not teach that the polyol has a functionality of at least 2.8, the isocyanate has a functionality of 2, and the NCO/OH ratio is .7 to 1.0.
- t. Matsuoka teaches a polyurethane composition with solving problems of heating fuse-loss characteristics, high temperature burning characteristics and residual ash content(abstract) which excels above previous compositions when cast in elasticity and intensity (§ 0135). It would have been obvious to one of ordinary skill in the art at the time the invention was made to cast an article using the method of Bianchin in view of Rusche with the polyurethane composition of Matsuoka. The composition taught by Matsuoka is a two-pack polyurethane hardening type resin comprising a polyol ingredient with a functionality of 2.8, a

polyisocyanate ingredient with a functionality of 2.0 and an NCO/OH ratio of .7-1.0(¶ 0018), and a plasticizer (¶ 0017).

u. With regards to claim 11 with respect to claim 10, Matsuoka teaches that the resin has phase separation micro distribution of the plasticizer (¶ 0019).

v. With regards to claims 12 and 13, Matsuoka teaches that the composition contains 2-25% by weight a polyether chain (¶ 0020).

w. With regards to claims 14-17, Matsuoka teaches that the composition contains 1 to 20% wax. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a weight percentage of wax of 5% to 20%.

x. With regards to claims 19-25, the article formed by Bianchin in view of Rusche in view of Vihtelic in view of Sagawa is used in a lost-wax process as noted by Vihtelic (abstract).

y. With regards to claim 27, Bianchin teaches that the hollow article formed is filled with foamed polyurethane (col 6 Example 3).

z. With regards to claim 29, Matsuoka teaches that the article formed is used in lost wax processing using the destruction by fire method (¶ 0025). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the article formed by the process of Bianchin in view of Rusche in view of Matsuoka for lost wax processing.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

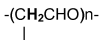
9. Claims 28 and 29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

aa. Claims 28 and 29 provide for the use of a resin model, but, since the claims do not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claims 28 and 29 are rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

Specification

10. The disclosure is objected to because of the following informalities: The diagram used to depict the desired polyether structure on pages 10 and 21 of the specification shown below is incorrect, because it would require 5 bonds to the carbon. It was assumed that the two hydrogen atoms attached to the left carbon should have been one hydrogen atom to comply with valence requirements of the carbon.



Art Unit: 4111

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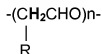
A correct structure would look as follows:



Appropriate correction is required.

Claim Objections

11. Claims 12 and 13 are objected to because of the following informalities: The diagram used to depict the desired polyether structure shown below is incorrect, because it would require 5 bonds to the carbon on the left. It was assumed that the two hydrogen atoms attached to the left carbon should have been one hydrogen atom to comply with valence requirements of the carbon.



A correct structure would look as follows:



Appropriate correction is required.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GALEN HAUTH whose telephone number is (571)270-5516. The examiner can normally be reached on Monday to Thursday 7:30am-5:00pm ET.

Art Unit: 4111

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sam Yao can be reached on (571)272-1224. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GHH/

/Sam Chuan C. Yao/
Supervisory Patent Examiner, Art Unit 4111